

## Definition

The manipulation of species composition, stand structure and stocking by cutting or killing selected trees and understory vegetation.

## Purpose

- To increase the quantity and quality of forest products, e.g., sawtimber, veneer, wood fiber, poles, pilings, maple syrup, naval stores, nuts and fruits
- To harvest forest products
- To initiate forest stand regeneration
- To reduce the potential of damage from wildfire, pests, and moisture stress
- To restore natural plant communities
- To achieve a desired understory plant community
- To improve aesthetic, recreation, and open space values
- To improve wildlife habitat
- To improve water conservation and yield
- To achieve a desired level of crop tree stocking and density
- To increase carbon storage in selected crop trees
- For renewable energy production
- To alter light regimes or obtain wood for the production of non-timber forest products

## Condition Where Practice Applies

All forest land where improvement of forest resources is needed.

## Silvicultural Systems

A silvicultural system is a planned series of treatments for tending, harvesting, and re-establishing a forest stand. The type of silvicultural system selected depends on

many factors. These may include the owner's objectives for the woodlot, the environmental conditions, the age class of the stand, and the tree species present and desired for the future.



## Types of Silvicultural Treatments

Regeneration or reproduction treatments are applied to mature stands that are ready for harvest. These treatments remove the large trees as efficiently as possible while creating environmental conditions favorable for the establishment of a new crop of trees. Concern for the immediate regeneration of new trees is the most significant difference between silviculture and exploitative logging. To encourage sun-loving species like yellow-poplar in the new stand, the owner and the forester might select an even-aged system. To encourage species like maple that grow well in the shade, an uneven-aged system might be selected. Species like northern red oak regenerate well in partial shade; systems that include gradual removal of the large trees favor oak.

Intermediate treatments are applied to established immature forests to improve them. They may be undertaken to remove poor quality trees; to remove undesirable tree species (weeds); to thin the stand and increase the growth rate of residual (or leave) trees; to remove large, poor-quality

trees that are shading smaller, good-quality trees; to remove insect-or disease-infested trees; or to salvage timber damaged by insects, disease, fire, or extreme weather.

One type of intermediate treatment popular among landowners is crop tree management.

Crop trees are enhanced by removing other trees whose crowns touch or extend above or below their crown. This provides the crop trees with more sunlight, moisture, and nutrients, allowing them to grow more rapidly.

### **Pre-Commercial Forest Stand Improvement**

At times pre-commercial silvicultural treatments may be applied to crop trees in established immature stands. These practices are intended to improve the quality, growth, and subsequent future value as a timber product, source of food and/or cover for wildlife, recreation, and/or aesthetics. The silvicultural treatments improve the vigor of individual crop trees and subsequently the health of residual stands.

Treatments may be used to release crop trees, thin overstocked stands, or remove cull trees and grapevines.

### **Area Wide Thinning**

The area wide thinning practice is a precommercial silvicultural treatment applied area wide in established immature stands to regulate stand density and stocking. Its purpose is to accomplish stand specific landowner objectives (primarily timber production) that can be realized by concentrating growth on trees with better form and higher potential value as a timber product. This silvicultural treatment will improve the vigor of the stand and subsequently, the health of the residual stand. The landowner can remove defective trees, limit the number of trees of

undesirable species and improve the spacing of the remaining trees. The stand should have a red oak site index of at least 60 and have dominant and codominant trees that are at least 25 feet in height. At least 20 square feet of basal area should be removed. Crown thinning should generally be used to remove enough from other crown classes to achieve the desired basal area and stocking level. Area wide thinning should be conducted in poletimber and/or small sawtimber stands (4"–12" diameter at breast height (DBH)).



### **Cull Tree Removal**

Cull tree removal is the practice of felling or deadening non merchantable trees, including wolf trees, deformed trees, and weed trees for the purpose of providing room for the main crop trees to continue and increase their development of the main stand. The purpose of cull tree removal is to provide room for the main crop trees to continue their development. Cull tree removal should be considered only when timber production is the primary objective. A cull tree is any tree 4" DBH and larger that contains so little merchantable material because of rot, crook, sweep, and other defects or if of inferior species that it cannot be harvested at a profit and is interfering with the development of the main stand. Cull tree removal is applicable in stands with a red oak site index

of 60 or better having a high percentage of non-merchantable trees because of defects or undesirable species. Stands must have a minimum of 20 crop trees per acre or potential crop trees that will benefit from cull removal. For uneven aged stands 50 square feet of basal area of trees 6" DBH and over should be the minimum stocking. This practice should be applied 5 or more years before or at least 2 years after a planned harvest. Culls may be cut or deadened, however, deadening is recommended if felling of trees will cause appreciable damage to residual trees. In some cases, trees that are to be deadened should be treated with herbicide.

The killing of cull trees may be accomplished by girdling with a chainsaw. Best results are usually obtained by the following:

For trees 6" DBH and smaller, felling using care to protect the residual stand. Stump treatment may be considered on certain sites and for certain species.

For trees 6" DBH and larger, a double cut is required at 2"- 4" apart. Each cut must be at least 1" deep into the wood and must completely encircle the tree.

Leaving two den trees, nut trees, cull and wolf trees valuable to wildlife can be left.

### **Grapevine Removal**

Grapevines are deadened to stop present damage and reduce or prevent future damage to quality hardwood stands. Grapevine control should be applied in hardwood timber stands with a red oak site index of 60 or higher where growing high quality hardwoods is the primary objective and more than 5 percent of the trees on a per acre basis have grapevines in the crowns. This practice should not be applied in stands where codominant trees are less than 15 feet tall and a well developed closed

canopy is not present. Cut all grapevines near ground line that are attached to the tree crowns. Also, sever all grapevines in the crowns of trees surrounding the arbor openings. Try to apply the grapevine cutting control measures during the dormant season and ideally with a few inches of snow on the ground. Herbicide application is not necessary if crown shading from a well developed closed canopy exists. Stands should have at least 40 grapevine stems per acre to receive treatment. It is recommended that a timber harvest not be undertaken on sites receiving vine control for at least three to five years following treatment. Existing grape arbors should be left intact since, in most cases, permanent damage has already occurred and removal of all vines is not practical. Grapevines provide wildlife food and habitat. Careful consideration should be given to wildlife benefits when developing stand treatment prescriptions.

### **Crop Tree Release**

Crop tree release is a precommercial silvicultural treatment applied to individual crop trees in established immature stands. Crop tree management focuses on releasing individual trees that have been selected to produce benefits consistent with stand-specific objectives. Refer to Technical Guide Reference – Crop Tree Management in Eastern Hardwoods. The purpose of the crop tree release practice is to accomplish stand specific landowner objectives that can be realized by increasing the growth rate of individual crop trees, and improving their quality and subsequent future value as a timber product, source of scenic beauty, or source of food and/or cover for wildlife. Crop tree release should be used in immature stands having a red oak site index of 60 or better and having dominant or codominant trees at least 25 feet tall. Select a maximum of 50 of the best dominant or codominant trees per acre. Remove all trees whose



crowns are touching the crown of the selected crop tree.

In those instances where the landowner wants to culture his forest before the trees are merchantable, the following forest types lend themselves to the some or all of the timber stand improvement practices discussed above:

### **Woodland Protection**

It is important for landowners to recognize threats to the health and productivity of their woodlands. Some of these threats, especially those posed by damaging wind, drought, and other weather conditions, cannot be controlled by landowners. However, landowners can participate in the protection of their woodlands from insect pests, diseases, uncontrolled fire, and livestock grazing.

#### **Uncontrolled Fires**

Uncontrolled fires, or wildfires, may cause considerable damage to unprotected woodlands. In West Virginia, rapidly spreading and dangerous crown fires that kill mature trees outright are usually rare. However, ground fires are prevalent, especially in early spring before trees have foliated and in the fall after leaves have fallen. Ground fires may kill saplings and damage the bark and trunks of mature trees. Scars, or cat-faces, left on tree trunks by even relatively “cool” fires may significantly reduce the value of timber cut from the trees. Fire damage also reduces tree growth rates and makes trees more susceptible to insects, diseases, and drought.

#### **Livestock Grazing**

Livestock grazing may be the most damaging and yet most preventable of all threats to woodland health and productivity. Cattle and other livestock may cause serious immediate damage to seedlings, saplings, and ground vegetation; what is not browsed by livestock will be trampled. In just a few

years, the understory may be completely absent or replaced by less valuable species, such as ironwood and hawthorn. At the same time, livestock compact forest soils which in turn damages mature trees. Within 10 years, continued grazing causes weakening and mortality of the trees.



In addition, woodlands make very poor pasture; studies have shown that livestock lose weight when grazed in woodlands. Therefore, grazed woodlands result in loss of both livestock and natural resources values.

### **Other Concerns**

The method, felling direction and timing of tree cutting for should provide a safe work environment and protect sensitive areas such as vernal pools, riparian zones, cultural resources and structures.

Slash and debris left on the site after treatment will not present an unacceptable fire, safety, environmental, or pest hazard. Such remaining material will not interfere with the intended purpose or other management activities.

Potential landowner and operator liability should be assessed before forest stand improvement activities begin.

### **Wildlife**

Forest stand improvement provides excellent opportunities to improve wildlife habitat for some species by favoring tree species that provide food and/or cover for desired wildlife. Refer to West Virginia conservation practice standard 645 - Upland Wildlife Habitat Management for information regarding the daily and seasonal requirements for selected wildlife species.

The practice should be timed to minimize disturbance of seasonal wildlife activities.

Consider wildlife food and cover needs when making modifications to forest composition and tree spacing.

Consider retention of selected dead and dying trees, including down material, to enhance wildlife habitat values.

Consider environmental concerns such as threatened and endangered species and natural areas.

### **Operation and Maintenance**

Periodic inspections during treatment activities are necessary to ensure that objectives are achieved and resource damage is minimized. Follow-up and ongoing management activities will be needed to obtain desired results. Protect trees and shrubs from destructive grazing.

If after reviewing this fact sheet you would like technical assistance with completing a timber harvest on your property, you should contact a professional forester to obtain specific recommendations for your woodland.

Assistance can be obtained from West Virginia Division of Forestry (WVDOP) service foresters, industrial landowner assistance program foresters, private consulting foresters, and industrial procurement foresters.

**For information on where to obtain this type of assistance, contact your local NRCS office at \_\_\_\_\_.**

**Note: The information in this fact sheet does not meet the plans and specification requirements of NRCS Practice Standard 666 – Forest Stand Improvement**

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### **Where to Get Help**